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NATIONAL EUTROPHICATION SURVEY

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16. ABSTRACT

Annual total phosphorus and total nitrogen loadings to the lake were estimated and subdivided according to either point or non-point source origin. An assessment of the lake's trophic condition and limiting nutrient is also provided. All data collected by the U.S.E.P.A. National Eutrophication Survey during the one year study of the lake and its tributaries are included in the report.

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REPORT

ON

RATHBUN RESERVOIR

APPANOOSE, LUCAS, MONROE, AND WAYNE COUNTIES IOWA

EPA REGION VII

WORKING PAPER No. 502

WITH THE COOPERATION OF THE

IOWA DEPARTMENT OF ENVIRONMENTAL QUALITY

AND THE

IOWA NATIONAL GUARD

DECEMBER, 1976

CONTENTS

	Page
Foreword	ii
List of Iowa Study Lakes	iv
Lake and Drainage Area Map	v
Sections	
I. Conclusions	1
II. Lake and Drainage Basin Characteristics	4
III. Lake Water Quality Summary	5
IV. Nutrient Loadings	10
V. Literature Reviewed	16
VI. Appendices	17

FOREWORD

The National Eutrophication Survey was initiated in 1972 in response to an Administration commitment to investigate the nationwide threat of accelerated eutrophication to freshwater lakes and reservoirs.

OBJECTIVES

The Survey was designed to develop, in conjunction with state environmental agencies, information on nutrient sources, concentrations, and impact on selected freshwater lakes as a basis for formulating comprehensive and coordinated national, regional, and state management practices relating to point-source discharge reduction and non-point source pollution abatement in lake watersheds.

ANALYTIC APPROACH

The mathematical and statistical procedures selected for the Survey's eutrophication analysis are based on related concepts that:

a. A generalized representation or model relating sources, concentrations, and impacts can be constructed.

b. By applying measurements of relevant parameters associated with lake degradation, the generalized model can be transformed into an operational representation of a lake, its drainage basin, and related nutrients.

c. With such a transformation, an assessment of the potential for eutrophication control can be made.

LAKE ANALYSIS

In this report, the first stage of evaluation of lake and watershed data collected from the study lake and its drainage basin is documented. The report is formatted to provide state environmental agencies with specific information for basin planning [§303(e)], water quality criteria/standards review [§303(c)], clean lakes [§314(a,b)], and water quality monitoring [§106 and §305(b)] activities mandated by the Federal Water Pollution Control Act Amendments of 1972.

Beyond the single lake analysis, broader based correlations between nutrient concentrations (and loading) and trophic condition are being made to advance the rationale and data base for refinement of nutrient water quality criteria for the Nation's freshwater lakes. Likewise, multivariate evaluations for the relationships between land use, nutrient export, and trophic condition, by lake class or use, are being developed to assist in the formulation of planning guidelines and policies by EPA and to augment plans implementation by the states.

ACKNOWLEDGMENT

The staff of the National Eutrophication Survey (Office of Research & Development, U. S. Environmental Protection Agency) expresses sincere appreciation to the Iowa Department of Environmental Quality for professional involvement, to the Iowa National Guard for conducting the tributary sampling phase of the Survey, and to those wastewater treatment plant operators who voluntarily provided effluent samples and flow data.

The staff of the Water Quality Division of the Department of Environmental Quality provided invaluable lake documentation and counsel during the Survey, reviewed the preliminary reports, and provided critiques most useful in the preparation of this Working Paper series.

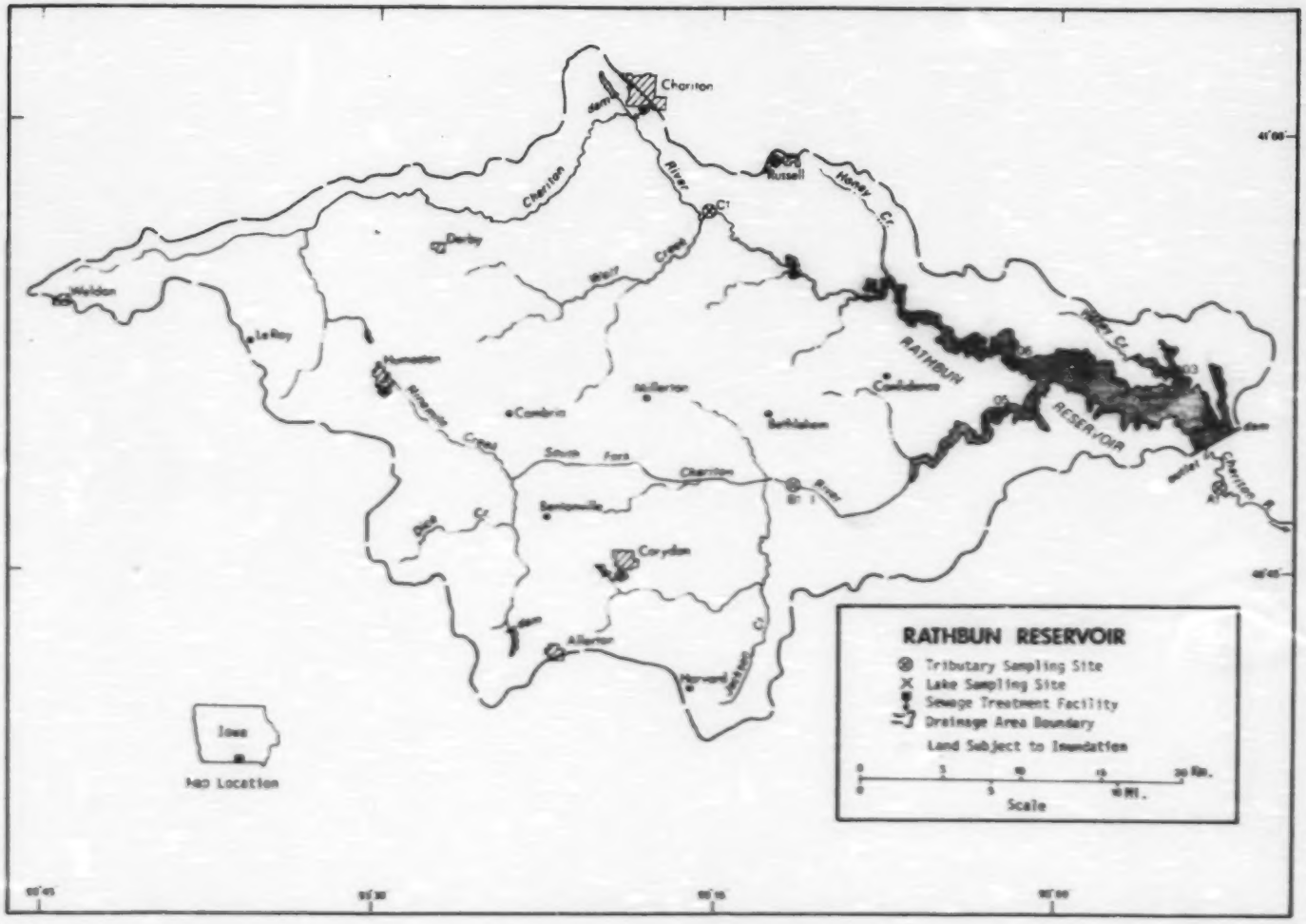
Major General Joseph G. May, the Adjutant General of Iowa, and Project Officer Colonel Cleadeth P. Woods, who directed the volunteer efforts of the Iowa National Guardsmen, are also gratefully acknowledged for their assistance to the Survey.

NATIONAL EUTROPHICATION SURVEY

STUDY LAKES

STATE OF IOWA

LAKE NAME	COUNTY
Ahquabi	Warren
Big Creek Reservoir	Polk
Black Hawk	Sac
Clear	Cerro Gordo
Darling	Washington
Lost Island	Clay, Palo Alto
MacBride	Johnson
Prairie Rose	Shelby
Rathbun Reservoir	Appanoose, Wayne
Red Rock Reservoir	Marion
Rock Creek	Jasper
Silver	Worth
Spirit	Dickinson
Viking	Montgomery
West Okoboji	Dickinson


Chariton
Russell
Derby
Weldon
Le Roy
Cambria
Williamson
Corydon
Allerton
RATHBUN RESERVOIR
Tributary Sampling Site
Lake Sampling Site
Sewage Treatment Facility
Drainage Area Boundary
Land Subject to Inundation
Scale
Iowa
Map Location

RATHBUN RESERVOIR

STORET NO. 1909

I. CONCLUSIONS

A. Trophic Condition:

Survey data indicate that Rathbun Reservoir is eutrophic. It ranked seventh in overall trophic quality when the 15 Iowa lakes and reservoirs sampled in 1974 were compared using a combination of six parameters*. Eight of the water bodies had less median total phosphorus, two had less median dissolved phosphorus, nine had less median inorganic nitrogen, two had less mean chlorophyll a, and ten had greater mean Secchi disc transparency. Marked depression of dissolved oxygen with depth occurred at stations 1, 4, 5, and 6 in July, 1974.

Survey limnologists did not observe phytoplankton concentrations or higher aquatic vegetation but did report high turbidity.

B. Rate-Limiting Nutrient:

The algal assay results indicate that Rathbun Reservoir was phosphorus limited at the times the assay samples were collected (04/19/74 and 09/24/74). The reservoir data also indicate phosphorus limitation at both sampling times.

C. Nutrient Controllability:

1. Point sources--During the sampling year, the phosphorus contributions of domestic point sources amounted to 8.7% of the

* See Appendix A.

total phosphorus load. The Chariton wastewater treatment plant contributed 6.1%, the four Corydon wastewater treatment plants collectively contributed 1.6%, and the Russell and Humeston wastewater treatment plants each contributed 0.5% of the total phosphorus load reaching Rathbun Reservoir.

The present phosphorus loading of 2.44 $g/m^2/yr$ is almost five times that proposed by Vollenweider (Vollenweider and Dillon, 1974) as a eutrophic loading (see page 15). It is calculated that 100% phosphorus removal at the above domestic point sources would reduce the phosphorus loading to 2.25 $g/m^2/yr$ (4½ times the eutrophic loading). However, because the reservoir is phosphorus limited, any increase in point-source phosphorus inputs should be discouraged to prevent further deterioration of the trophic condition of the reservoir.

Agena (1975) calculated a phosphorus point-source load to Rathbun Reservoir of 9,715 kg P/yr which is in very close agreement with the Survey value of 9,535 kg P/yr.

2. Non-point sources--The phosphorus contributions of non-point sources accounted for 91.3% of the total phosphorus load during the sampling year. The Chariton River contributed 45.6%, the South Fork Chariton River contributed 14.4%, and ungaged tributaries were estimated to have contributed 30.5% of this load.

Agena (op. cit.) calculated a non-point phosphorus load of 113,500 kg/yr which compares fairly well with the Survey value of 99,320

kg/yr.

The nutrient export rates of the Chariton River were much higher than those of the South Fork Chariton River even though the drainage areas are similar in size. The higher Chariton River rates may be due to urban runoff in the Chariton area, underestimation of the Chariton wastewater treatment plant loads, or both (note that the Chariton wastewater treatment plant flows appear to be estimates).

The Chariton River and South Fork Chariton River embayments of Rathbun Reservoir are within the 53 km^2 wildlife management area, and the refuge waters are utilized by migrating geese and ducks (Harrison, 1976).

On the basis of information provided by personnel of the Iowa Conservation Commission (Bishop, 1976), the amounts of nutrients contributed to Rathbun Reservoir by migratory waterfowl were estimated (see page 11 for method of calculation).

Collectively, geese and ducks using the refuge added an estimated 155 kg P and 495 kg N during the sampling year and accounted for 0.1% of the total phosphorus load and less than 0.1% of the total nitrogen load.

II. LAKE AND DRAINAGE BASIN CHARACTERISTICS†

A. Lake Morphometry††:

1. Surface area: 44.52 kilometers^2.
2. Mean depth: 6.7 meters.
3. Maximum depth: 13.7 meters.
4. Volume: 298.284 x 10^6 m^3.
5. Mean hydraulic retention time: 1.0 years.

B. Tributary and Outlet:
(See Appendix C for flow data)

1. Tributaries -

Name	Drainage area (km^2)*	Mean flow (m^3/sec)*
South Fork Chariton River	435.1	2.77
Chariton River	471.4	3.00
Minor tributaries & immediate drainage -	470.9	3.28
Totals	1,377.4	9.05

2. Outlet -

Chariton River	1,421.9**	9.04

C. Precipitation***:

1. Year of sampling: 76.8 centimeters.
2. Mean annual: 85.6 centimeters.

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† Table of metric conversions--Appendix B.
†† Harrison, 1975.
* For limits of accuracy, see Working Paper No. 175, "...Survey Methods, 1973-1976".
** Includes area of reservoir.
*** See Working Paper No. 175.

III. LAKE WATER QUALITY SUMMARY

Rathbun Reservoir was sampled three times during the open-water season of 1974 by means of a pontoon-equipped Huey helicopter. Each time, samples for physical and chemical parameters were collected from a number of depths at six stations on the reservoir (see map, page v). During each visit, a single depth-integrated (4.6 m to surface) sample was composited from the stations for phytoplankton identification and enumeration; and during the first and third visits, a single 18.9-liter depth-integrated sample was composited for algal assays. Also each time, a depth-integrated sample was collected from each of the stations for chlorophyll a analysis. The maximum depths sampled were 12.2 meters at station 1, 7.6 meters at station 2, 9.1 meters at station 3, 10.7 meters at station 4, 6.4 meters at station 5, and 7.6 meters at station 6.

The sampling results are presented in full in Appendix D and are summarized in the following table (the July nutrient samples were not preserved properly and were not analyzed).

A. SUMMARY OF PHYSICAL AND CHEMICAL CHARACTERISTICS FOR RATHBUN RESERVOIR
STORET CODE 1909

PARAMETER	1ST SAMPLING (4/19/74) 6 SITES RANGE	MEAN	MEDIAN	2ND SAMPLING (7/ 3/74) 6 SITES RANGE	MEAN	MEDIAN	3RD SAMPLING (9/24/74) 6 SITES RANGE	MEAN	MEDIAN
TEMP (C)	9.1 - 13.5	10.6	10.5	19.8 - 26.8	23.8	23.8	16.4 - 18.3	17.6	17.9
DISS OXY (MG/L)	9.4 - 11.4	10.7	11.0	1.0 - 8.8	5.5	6.4	7.8 - 8.4	8.1	8.0
CNDCTVY (MCROMO)	174. - 348.	209.	184.	173. - 285.	258.	273.	222. - 244.	232.	232.
PH (STAND UNITS)	8.2 - 9.0	8.5	8.4	6.9 - 8.2	7.7	7.8	7.1 - 7.3	7.2	7.2
TOT ALK (MG/L)	76. - 142.	90.	81.	****** -**********			94. - 124.	105.	103.
TOT P (MG/L)	0.070 - 0.120	0.085	0.085	****** -**********			0.036 - 0.104	0.053	0.048
ORTHO P (MG/L)	0.005 - 0.017	0.008	0.007	****** -**********			0.007 - 0.013	0.010	0.009
NO2+NO3 (MG/L)	0.650 - 1.340	1.063	1.125	****** -**********			1.000 - 1.330	1.135	1.125
AMMONIA (MG/L)	0.030 - 0.100	0.045	0.040	****** -**********			0.020 - 0.050	0.037	0.040
KJEL N (MG/L)	0.600 - 1.500	0.850	0.800	****** -**********			0.400 - 0.800	0.545	0.500
INORG N (MG/L)	0.690 - 1.420	1.109	1.180	****** -**********			1.040 - 1.360	1.171	1.160
TOTAL N (MG/L)	1.350 - 2.600	1.913	1.890	****** -**********			1.440 - 2.030	1.680	1.655
CHLRPYL A (UG/L)	15.1 - 38.8	27.1	27.0	0.1 - 7.7	3.0	2.5	4.0 - 7.9	5.9	6.1
SECCHI (METERS)	0.6 - 0.8	0.7	0.8	0.1 - 0.8	0.5	0.5	0.3 - 0.9	0.6	0.6

B. Biological characteristics:

1. Phytoplankton

Sampling Date	Dominant Genera	Algal Units per ml
04/19/74	1. Stephanodicus sp.	30,898
	2. Flagellates	958
	3. Ankestrodesmus sp.	766
	4. Melosira sp.	479
	5. Trachelomonas sp.	287
	Other genera	432
	Total	33,820
07/03/74	1. Melosira sp.	308
	2. Flagellates	213
	3. Cryptomonas sp.	142
	4. Kirchneriella sp.	95
	5. Stephanodiscus sp.	71
	Other genera	216
	Total	1,045
09/24/74	1. Melosira sp.	818
	2. Flagellates	570
	3. Cyptomonas sp.	248
	4. Stephanodiscus sp.	198
	5. Raphidiopsis sp.	124
	Other genera	719
	Total	2,677

2. Chlorophyll *a* -

Sampling Date	Station Number	Chlorophyll *a* (µg/l)
04/19/74	1	23.4
	2	38.8
	3	15.1
	4	31.5
	5	25.3
	6	28.8
07/03/74	1	2.0
	2	7.7
	3	3.4
	4	2.8
	5	2.3
	6	0.1
09/24/74	1	4.4
	2	6.2
	3	4.0
	4	6.1
	5	7.9
	6	6.9

C. Limiting Nutrient Study:

1. Autoclaved, filtered, and nutrient spiked -

a. April samples -

1) Stations 1, 2, and 3

Spike (mg/l)	Ortho P Conc. (mg/l)	Inorganic N Conc. (mg/l)	Maximum yield (mg/l-dry wt.)
Control	0.015	1.060	2.5
0.050 P	0.065	1.060	14.4
0.050 P + 1.0 N	0.065	2.060	16.1
1.0 N	0.015	2.060	0.5

2) Stations 4, 5, and 6

Spike (mg/l)	Ortho P Conc. (mg/l)	Inorganic N Conc. (mg/l)	Maximum yield (mg/l-dry wt.)
Control	0.025	1.110	6.8
0.050 P	0.075	1.110	22.7
0.050 P + 1.0 N	0.075	2.110	20.8
1.0 N	0.025	2.110	5.6

b. September samples -

1) Stations 1, 2, and 3

Spike (mg/l)	Ortho P Conc. (mg/l)	Inorganic N Conc. (mg/l)	Maximum yield (mg/l-dry wt.)
Control	0.005	1.065	1.1
0.050 P	0 055	1.065	22.1
0.050 P + 1.0 N	0.055	2.065	18.8
1.0 N	0.005	2.065	1.0

2) Stations 4, 5, and 6

Spike (mg/l)	Ortho P Conc. (mg/l)	Inorganic N Conc. (mg/l)	Maximum yield (mg/l-dry wt.)
Control	0.015	1.045	2.3
0.050 P	0.065	1.045	16.1
0.050 P + 1.0 N	0.065	2.045	18.2
1.0 N	0.015	2.045	2.2

2. Discussion -

The control yields of the assay alga, Selenastrum capricornutum, indicate that the potential primary productivity of Rathbun Reservoir was moderately high at the times the assay samples were collected. The addition of phosphorus alone resulted in significant increases in yields compared to those of the controls in all cases, but the addition of only nitrogen did not. These results indicate phosphorus limitation.

The reservoir data also indicate phosphorus limitation. The mean inorganic nitrogen to orthophosphorus ratios were 117 to 1 or greater, and phosphorus limitation would be expected.

IV. NUTRIENT LOADINGS
(See Appendix E for data)

For the determination of nutrient loadings, the Iowa National Guard collected monthly near-surface grab samples from each of the tributary sites indicated on the map (page v), except for the high runoff months of May and June when two samples were collected. Sampling was begun in August, 1974, and was completed in July, 1975.

Through an interagency agreement, stream flow estimates for the year of sampling and a "normalized" or average year were provided by the Iowa District Office of the U.S. Geological Survey for the tributary sites nearest the reservoir.

In this report, nutrient loads for sampled tributaries were determined by using a modification of a U.S. Geological Survey computer program for calculating stream loadings*. Nutrient loads shown are those measured minus point-source loads, if any.

Nutrient loads for unsampled "minor tributaries and immediate drainage" ("ZZ" of U.S.G.S.) were estimated using the means of the nutrient loads, in $kg/km^2/year$, at stations B-1 and C-1 and multiplying the means by the ZZ area in km^2.

The operator of the Chariton wastewater treatment plant provided monthly effluent samples and corresponding flow data. The communities of Corydon, Humeston, and Russell did not participate; nutrient loads from those sources were estimated at 1.134 kg P and 3.401 kg N/capita/year, and flows were estimated at 0.3785 m^3/capita/day.

Estimates of the nutrient contributions of migratory geese and ducks are based on waterfowl inventory data and refuge information provided by Bishop (1976).

* See Working Paper No. 175.

In 1974-75, goose-use-days totaled 409,000 and duck-use-days totaled 1,598,650 of which 918,450 were mallard-use-days.

In calculating the nutrient loads, the following assumptions were made:

1. One-half of the geese were common Canadas, and the remainder were snow and blue geese.

2. The geese spend one-fourth of the time away from refuge waters in the fall and one-half of the time in the spring; i.e., effective goose-use-days = 222,750.

3. Mallard ducks spent one-fourth of the time away from the refuge waters in the fall and one-half of the time in the spring; i.e., effective mallard-use-days = 563,875.

4. The remaining ducks spent practically all of the time on the refuge waters and thus essentially recycled nutrients from the reservoir back to the reservoir.

5. The physiology of waste excretion is similar among waterfowl, and the amount of feces produced is approximately proportional to body weight (Hutchinson, 1950).

6. The mean weight of common Canada geese is 3.870 kg, the mean weight of snow-blue geese is 2.289 kg, and the mean weight of mallard ducks is 1.148 kg (Kortright, 1943).

7. Common Canada geese contribute 0.439 g total phosphorus and 1.435 g total nitrogen per goose-use-day (Manny et al., 1975).

A. Waste Sources:

1. Known municipal† -

Name	Pop. Served	Treatment	Mean Flow (m^3/d)	Receiving Water
Chariton*	5,000	tr. filter	1,892.7	Chariton River
Corydon #1	60	stab. pond	22.7	Unnamed Cr./ S. Fk. Chariton River
#2	920	stab. pond	348.2	Unnamed Cr./ S. Fk. Chariton River
#3	500	stab. pond	189.2	Unnamed Cr./ S. Fk. Chariton River
#4	50	stab. pond	18.9	Unnamed Cr./ S. Fk. Chariton River
Humeston	500	stab. pond	189.2	Ninemile Cr./ S. Fk. Chariton River
Russell	500	stab. pond	189.2	Dry Run/Chariton River

2. Known industrial - None

† Anonymous, 1971.
* Hammons, 1974.

B. Annual Total Phosphorus Loading - Average Year:

1. Inputs -

Source	kg P/ yr	% of total
a. Tributaries (non-point load) -		
S. Fk. Chariton River	15,765	14.5
Chariton River	49,410	45.4
b. Minor tributaries & immediate drainage (non-point load) -	33,200	30.5
c. Known municipal STP's -		
Chariton	6,670	6.1
Corydon (4 ponds)	1,735	1.6
Humeston	565	0.5
Russell	565	0.5
d. Septic tanks* -	10	<0.1
e. Known industrial - None	-	-
f. Migratory waterfowl -		
Ducks	75	<0.1
Geese	80	<0.1
g. Direct precipitation** -	780	0.7
Total	108,855	100.0

2. Outputs -

Lake outlet - Chariton River 19,290

3. Net annual P accumulation - 89,565 kg.

* Estimate based on eight lakeshore parks and two campgrounds; see Working Paper No. 175.
** See Working Paper No. 175.

C. Annual Total Nitrogen Loading - Average Year:

1. Inputs-

Source	kg N/yr	% of total
a. Tributaries (non-point load) -		
S. Fk. Chariton River	174,950	19.5
Chariton River	371,265	41.3
b. Minor tributaries & immediate drainage (non-point load) -	280,185	31.2
c. Known municipal STP's -		
Chariton	15,180	1.7
Corydon (4 ponds)	5,205	0.6
Humeston	1,700	0.2
Russell	1,700	0.2
d. Septic tanks* -	425	<0.1
e. Known industrial - None	-	-
f. Migratory waterfowl -		
Ducks	240	<0.1
Geese	255	<0.1
g. Direct precipitation** -	48,065	5.3
Total	899,170	100.0

2. Outputs -

Lake outlet - Chariton River 546,945

3. Net annual N accumulation - 352,225 kg.

D. Mean Annual Non-point Nutrient Export by Subdrainage Area:

Tributary	kg P/km²/yr	kg N/km²/yr
South Fork Chariton River	36	402
Chariton River	105	788

* Estimate based on eight lakeshore parks and two campgrounds; see Working Paper No. 175.
** See Working Paper No. 175.

E. Yearly Loads:

In the following table, the existing phosphorus loadings are compared to those proposed by Vollenweider (Vollenweider and Dillon, 1974). Essentially, his "dangerous" loading is one at which the receiving water would become eutrophic or remain eutrophic; his "permissible" loading is that which would result in the receiving water remaining oligotrophic or becoming oligotrophic if morphometry permitted. A mesotrophic loading would be considered one between "dangerous" and "permissible".

Note that Vollenweider's model may not be applicable to water bodies with short hydraulic retention times.

	Total Phosphorus		Total Nitrogen	
	Total	Accumulated	Total	Accumulated
grams/m^2/yr	2.44	2.01	20.2	7.9

Vollenweider phosphorus loadings ($g/m^2/yr$) based on mean depth and mean hydraulic retention time of Rathbun Reservoir:	
"Dangerous" (eutrophic loading)	0.50
"Permissible" (oligotrophic loading)	0.25

V. LITERATURE REVIEWED

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VI. APPENDICES

APPENDIX A

LAKE RANKINGS

LAKE DATA TO BE USED IN RANKINGS

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500-MEAN SEC	MEAN CHLORA	15-MIN DO	MEDIAN DISS ORTHO P
1901	LAKE ACQUABI	0.062	0.335	469.333	8.600	8.200	0.009
1902	BIG CREEK RESERVOIR	0.046	6.465	436.500	16.867	14.800	0.011
1903	BLACK HAWK LAKE	0.185	0.130	488.167	49.740	15.000	0.020
1904	CLEAR LAKE	0.059	0.070	465.125	17.400	8.600	0.010
1905	LAKE DARLING	0.077	1.475	482.500	13.817	9.200	0.012
1906	LOST ISLAND LAKE	0.146	0.065	421.167	36.100	8.400	0.021
1907	LAKE MACBRIDE	0.061	2.035	458.444	17.067	15.000	0.010
1908	PRAIRIE ROSE LAKE	0.056	0.210	463.667	17.350	8.600	0.010
1909	RATHBUN RESERVOIR	0.071	1.170	475.889	12.039	14.000	0.008
1910	RED ROCK LAKE	0.180	1.880	473.400	14.730	14.000	0.104
1911	ROCK CREEK LAKE	0.065	1.400	480.500	18.367	8.400	0.007
1912	SILVER LAKE	0.193	0.565	482.667	95.300	10.000	0.034
1913	SPIRIT LAKE	0.041	0.090	422.667	12.622	9.000	0.007
1914	VIKING LAKE	0.075	0.130	459.000	26.033	14.200	0.017
1915	WEST LAKE OKOBOJI	0.046	0.060	380.444	7.722	15.000	0.017

PERCENT OF LAKES WITH HIGHER VALUES (NUMBER OF LAKES WITH HIGHER VALUES)

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500-MEAN SEC	MEAN CHLORA	15-MIN DO	MEDIAN DISS ORTHO P	INDEX NO
1901	LAKE ACQUABI	57 (8)	50 (7)	43 (6)	93 (13)	100 (14)	79 (11)	422
1902	BIG CREEK RESERVOIR	89 (12)	0 (0)	79 (11)	57 (8)*	21 (3)	50 (7)	296
1903	BLACK HAWK LAKE	7 (1)	68 (9)	0 (0)	7 (1)	7 (0)	21 (3)	110
1904	CLEAR LAKE	71 (10)	86 (12)	50 (7)	36 (5)	75 (10)	64 (8)	382
1905	LAKE OARLING	29 (4)	21 (3)	14 (2)	71 (10)	57 (8)	43 (6)	235
1906	LOST ISLAND LAKE	21 (3)	93 (13)	93 (13)	14 (2)	89 (12)	14 (2)	324
1907	LAKE MACBRIDE	64 (9)	7 (1)	71 (10)	50 (7)	7 (0)	64 (8)	263
1908	PRAIRIE ROSE LAKE	79 (11)	57 (8)	57 (8)	43 (6)	75 (10)	64 (8)	375
1909	RATHBUN RESERVOIR	43 (6)	36 (5)	29 (4)	86 (12)	39 (5)	86 (12)	319
1910	RED ROCK LAKE	14 (2)	14 (2)	36 (5)	64 (9)	39 (5)	0 (0)	167
1911	ROCK CREEK LAKE	50 (7)	29 (4)	21 (3)	29 (4)	89 (12)	96 (13)	314
1912	SILVER LAKE	0 (0)	43 (6)	7 (1)	0 (0)	50 (7)	7 (1)	107
1913	SPIRIT LAKE	100 (14)	79 (11)	86 (12)	79 (11)	64 (9)	96 (13)	504
1914	VIKING LAKE	36 (5)	68 (9)	64 (9)	21 (3)	29 (4)	32 (4)	250
1915	WEST LAKE OKOBOJI	89 (12)	100 (14)	100 (14)	100 (14)	7 (0)	32 (4)	428

LAKES RANKED BY INDEX NOS.

RANK	LAKE CODE	LAKE NAME	INDEX NO
1	1913	SPIRIT LAKE	504
2	1915	WEST LAKE OKOBOJI	428
3	1901	LAKE ACOUABI	422
4	1904	CLEAR LAKE	382
5	1908	PRAIRIE ROSE LAKE	375
6	1906	LOST ISLAND LAKE	324
7	1909	RATHBUN RESERVOIR	319
8	1911	ROCK CREEK LAKE	314
9	1902	BIG CREEK RESERVOIR	296
10	1907	LAKE MACBRIDE	263
11	1914	VIKING LAKE	250
12	1905	LAKE DARLING	235
13	1910	RED ROCK LAKE	167
14	1903	BLACK HAWK LAKE	110
15	1912	SILVER LAKE	107

APPENDIX B

CONVERSION FACTORS

CONVERSION FACTORS

Hectares x 2.471 = acres

Kilometers x 0.6214 = miles

Meters x 3.281 = feet

Cubic meters x 8.107×10^{-4} = acre/feet

Square kilometers x 0.3861 = square miles

Cubic meters/sec x 35.315 = cubic feet/sec

Centimeters x 0.3937 = inches

Kilograms x 2.205 = pounds

Kilograms/square kilometer x 5.711 = lbs/square mile

APPENDIX C

TRIBUTARY FLOW DATA

TRIBUTARY FLOW INFORMATION FOR IOWA 12/23/75

LAKE CODE 1909 RATHBUN RES.

TOTAL DRAINAGE AREA OF LAKE(SQ KM) 1421.9

TRIBUTARY	SUB-DRAINAGE AREA(SQ KM)	NORMALIZED FLOWS(CMS) JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
1909A1	1421.9	4.53	8.92	22.46	15.29	14.58	14.22	3.43	2.38	9.17	3.91	8.13	1.81	9.04
1909B1	435.1	1.38	2.73	6.88	4.67	4.47	4.39	1.05	0.73	2.81	1.20	2.49	0.55	2.77
1909C1	471.4	1.50	2.94	7.45	5.07	4.84	4.76	1.14	0.79	3.03	1.30	2.70	0.60	3.00
1909ZZ	515.4	1.63	3.23	8.16	5.55	5.30	5.21	1.25	0.86	3.31	1.42	2.94	0.65	3.28

SUMMARY

TOTAL DRAINAGE AREA OF LAKE = 1421.9
SUM OF SUB-DRAINAGE AREAS = 1421.9

TOTAL FLOW IN = 108.96
TOTAL FLOW OUT = 108.82

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
1909A1	8	74	0.37	17	0.31				
	9	74	0.31	8	0.31				
	10	74	0.34	5	0.37				
	11	74	0.28	3	0.28				
	12	74	12.26	7	21.61				
	1	75	0.91	4	1.47				
	2	75	0.26	1	0.23				
	3	75	5.44						
	4	75	20.84	20	5.69				
	5	75	8.66	3	20.27	21	1.70		
	6	75	5.41	10	2.94	25	5.64		
	7	75	11.41						
1909B1	8	74	0.05	17	0.07				
	9	74	0.03	8	0.04				
	10	74	0.74	5	2.10				
	11	74	0.54	3	0.51				
	12	74	0.65	7	2.94				
	1	75	0.40	4	0.31				
	2	75	0.59	1	0.25				
	3	75	6.29						
	4	75	4.59	20	2.63				
	5	75	1.70	3	0.82	21	0.21		
	6	75	11.04	10	0.45	25	39.64		
	7	75	0.18						

TRIBUTARY FLOW INFORMATION FOR IOWA 12/23/75

LAKE CODE 1909 RATHBUN RES.

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
1909C1	8	74	0.06	17	0.12				
	9	74	0.04	8	0.04				
	10	74	0.34	5	0.01				
	11	74	0.96	3	4.79				
	12	74	1.25	7	3.57				
	1	75	1.78	4	0.22				
	2	75	1.47	1	0.59				
	3	75	10.42						
	4	75	4.53	20	4.90				
	5	75	1.22	3	0.65	21	0.24		
	6	75	5.97	10	0.59	25	8.27		
	7	75	0.57						
1909Z2	8	74	0.06						
	9	74	0.04						
	10	74	0.62						
	11	74	0.85						
	12	74	1.08						
	1	75	1.25						
	2	75	1.19						
	3	75	9.49						
	4	75	5.18						
	5	75	1.67						
	6	75	9.68						
	7	75	0.42						

APPENDIX D

PHYSICAL and CHEMICAL DATA

STORET RETRIEVAL DATE 75/12/23

190901
40 49 30.0 092 53 33.0
RATHBUN RESERVOIR
19007 IOWA

11EPALES
3

2111202
0045 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
74/04/19	13 30	0000	10.6		30	185	9.00	79	0.050	0.900	1.260	0.008
	13 30	0005	10.3	11.4		180	8.50	76	0.030	0.700	1.150	0.006
	13 30	0015	9.4	11.2		179	8.40	77	0.030	0.700	1.150	0.006
	13 30	0040	9.3	10.2		174	8.20	78	0.040	0.600	1.170	0.007
74/07/03	14 45	0000	23.0	6.8	30	273	7.80					
	14 45	0005	22.9	7.0		272	7.80					
	14 45	0015	22.7	6.4		272	7.80					
	14 45	0025	22.3	5.8		269	7.60					
	14 45	0032	22.0	5.8		268	7.80					
	14 45	0040	19.8	2.8		257	7.60					
74/09/24	12 00	0000	18.3	7.8	36	232	7.19	96	0.050	0.500	1.110	0.008
	12 00	0005	18.3	8.0		232	7.17	96	0.030	0.400	1.190	0.009
	12 00	0015	18.2	8.0		232	7.17	96	0.030	0.400	1.320	0.008
	12 00	0037	17.9	7.8		231	7.14	97	0.040	0.400	1.110	0.012

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
74/04/19	13 30	0000	0.071	23.4	
	13 30	0005	0.073		
	13 30	0015	0.072		
	13 30	0040	0.072		
74/07/03	14 45	0000		2.0	
	14 45	0005			1.0
74/09/24	12 00	0000	0.039	4.4	
	12 00	0005	0.039		
	12 00	0008			1.0
	12 00	0015	0.044		
	12 00	0037	0.036		

STORET RETRIEVAL DATE 75/12/23

190902
40 53 19.0 092 52 24.0
RATHBUN RESERVOIR
19007 IOWA

11EPALES
3

2111202
0030 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
74/04/19	14	0000	10.7		30	182	8.80	82	0.040	0.800	0.880	0.008
	14	0005	10.7	11.4		181	8.70	81	0.040	0.800	0.920	0.006
	14	0015	9.6	10.0		179	8.30	81	0.080	0.700	0.970	0.006
	14	0025	9.3	9.4		179	8.20	80	0.100	1.500	1.100	0.008
74/07/03	14	0000	24.6	8.2	30	282	7.90					
	14	0005	24.6	7.6		281	7.90					
	14	0015	24.0	7.4		279	7.70					
	14	0023	23.1	6.8		273	7.90					
74/09/24	11	0000	17.9	8.0	24	233	7.26	98	0.050	0.500	1.030	0.007
	11	0005	17.9	8.2		233	7.26	98	0.050	0.400	1.040	0.007
	11	0015	17.9	8.0		233	7.25	98	0.050	0.500	1.100	0.008
	11	0021	17.9	8.0		232	7.23	96	0.050	0.600	1.140	0.008

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
74/04/19	14	0000	0.080	38.8	
	14	0005	0.070		
	14	0015	0.096		
	14	0025	0.087		
74/07/03	14	0000		7.7	
	14	0005			1.0
74/09/24	11	0000	0.039	6.2	
	11	0005	0.037		
	11	0006			1.0
	11	0015	0.046		
	11	0021	0.049		

STORET RETRIEVAL DATE 75/12/23

190903
40 51 46.0 092 54 37.0
RATHBUN RESERVOIR
19007 IOWA

11EPALES 2111202
3 0030 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
74/04/19	14 20	0000	10.2		30	179	8.60	78	0.060	0.800	1.090	0.007
	14 20	0005	10.0	11.4		179	8.60	79	0.040	0.900	1.080	0.008
	14 20	0015	9.8	11.2		178	8.50	81	0.030	0.800	1.090	0.006
	14 20	0025	9.1	10.2		175	8.20	80	0.070	0.800	1.090	0.006
74/07/03	15 15	0000	24.9	7.8	18	281	8.00					
	15 15	0005	24.5	7.4		280	8.20					
	15 15	0015	24.0	7.4		278	8.00					
	15 15	0022	23.5	8.8		275	7.90					
	15 15	0030	23.2	6.4		274	7.80					
74/09/24	11 05	0000	18.3	8.0	30	233	7.17	112	0.030	0.500	1.200	0.008
	11 05	0005	18.3	7.8		232	7.07	94	0.040	0.500	1.030	0.013
	11 05	0015	18.2	8.0		233	7.14	96	0.030	0.400	1.090	0.008
	11 05	0025	18.2	8.0		233	7.08	96	0.030	0.500	1.070	0.008

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCOT LT REMNING PERCENT
74/04/19	14 20	0000	0.081	15.1	
	14 20	0005	0.071		
	14 20	0015	0.071		
	14 20	0025	0.078		
74/07/03	15 15	0000		3.4	
	15 15	0004			1.0
74/09/24	11 05	0000	0.046	4.0	
	11 05	0005	0.047		
	11 05	0006			1.0
	11 05	0015	0.042		
	11 05	0025	0.049		

STORET RETRIEVAL DATE 75/12/23

190904
40 52 21.0 092 59 03.0
RATHBUN RESERVOIR
19007 IOWA

11EPALES 2111202
3 0033 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
74/04/19	15 50	0000	10.6		30	190	8.40	80	0.040	0.800	1.190	0.008
	15 50	0005	10.5	11.2		191	8.40	79	0.030	0.800	1.180	0.009
	15 50	0015	10.5	11.0		190	8.40	82	0.030	0.900	1.210	0.008
	15 50	0028	10.0	11.0		189	8.30	82	0.030	0.900	1.190	0.007
74/07/08	10 15	0000	26.1	5.4	24	283	7.90					
	10 15	0005	25.7	7.0		285	7.80					
	10 15	0015	25.1	6.6		280	7.80					
	10 15	0025	22.6	3.4		260	7.40					
	10 15	0035	22.0	1.0		217	7.30					
74/09/24	10 35	0000	17.6	8.4	24	229	7.26	112	0.030	0.500	1.330	0.011
	10 35	0005	17.6	8.2		228	7.25	112	0.020	0.400	1.140	0.009
	10 35	0017	17.4	8.0		229	7.24	113	0.020	0.400	1.180	0.009

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
74/04/19	15 50	0000	0.092	31.5	
	15 50	0005	0.087		
	15 50	0015	0.095		
	15 50	0028	0.096		
74/07/08	10 15	0000		2.8	
	10 15	0003			1.0
74/09/24	10 35	0000	0.055	6.1	
	10 35	0005	0.051		
	10 35	0011			1.0
	10 35	0017	0.048		

STORET RETRIEVAL DATE 75/12/23

190905
40 50 31.0 093 02 34.0
RATHBUN RESERVOIR
19007 IOWA

11EPALES
3

2111202
0022 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
74/04/19	16 15	0000	13.5		24	348	8.60	140	0.030	0.800	0.660	0.011
	16 15	0005	12.8	10.8		345	8.50	142	0.030	0.900	0.660	0.014
	16 15	0018	12.1	9.4		343	8.25	141	0.050	0.700	0.650	0.017
74/07/08	10 00	0000	26.7	2.8	2	219	7.30					
	10 00	0005	25.9	3.2		224	7.30					
	10 00	0015	22.2	1.0		173	7.00					
	10 00	0021	22.1	2.0		177	6.90					
74/09/24	10 10	0000	16.5	8.2	12	243	7.25	124	0.040	0.800	1.230	0.012
	10 10	0005	16.4	8.2		243	7.25	123	0.030	0.800	1.210	0.011
	10 10	0017	16.4	8.4		244	7.24	122	0.040	0.600	1.210	0.012

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
74/04/19	16 15	0000	0.120	25.3	
	16 15	0005	0.099		
	16 15	0018	0.089		
74/07/08	10 00	0000		2.3	
74/09/24	10 10	0000	0.081	7.9	
	10 10	0002			1.0
	10 10	0005	0.091		
	10 10	0017	0.104		

STORET RETRIEVAL DATE 75/12/23

190906
40 52 19.0 093 02 02.0
MATHBUN RESERVOIR
19007 IOWA

11EPALES 2111202
3 0022 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
74/04/19	16 40	0000	12.1		24	226	8.90	95	0.040	0.900	1.180	0.007
	16 40	0005	12.1	11.4		225	8.80	92	0.030	1.000	1.180	0.005
	16 40	0018	10.8	10.4		213	8.40	90	0.080	1.000	1.340	0.008
74/07/08	09 30	0000	26.8	6.6	12	281	7.70					
	09 30	0005	25.8	6.0		251	7.60					
	09 30	0015	24.1	5.2		230	7.40					
	09 30	0025	22.6	1.6		222	7.20					
74/09/24	09 40	0000	16.9	8.2	24	222	7.24	109	0.040	0.800	1.000	0.013
	09 40	0005	16.9	8.0		222	7.25	107	0.040	0.700	1.010	0.011
	09 40	0015	16.9	8.2		223	7.24	108	0.030	0.700	1.160	0.011
	09 40	0020	16.9	8.2		223	7.24	108	0.040	0.700	1.060	0.011

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L	00031 INCDT LT REMNING PERCENT
74/04/19	16 40	0000	0.084	28.8	
	16 40	0005	0.093		
	16 40	0018	0.101		
74/07/08	09 30	0000		0.1	
	09 30	0002			1.0
74/09/24	09 40	0000	0.056	6.9	
	09 40	0004			1.0
	09 40	0005	0.058		
	09 40	0015	0.058		
	09 40	0020	0.054		

APPENDIX E

TRIBUTARY and WASTEWATER TREATMENT PLANT DATA

STORET RETRIEVAL DATE 76/01/27

1909A1
40 48 47.0 092 52 57.0
CHARITON RIVER
19185 7.5 MYSTIC
O/RATHBUN RESERVOIR
LGHT DTY RD BRDG 1 MI N OF RATHBUN
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/08/17	09 00		1.200	0.700	0.025	0.025	0.120
74/09/07	15 30		1.060	0.800	0.050	0.020	0.110
74/10/05	15 00		1.010	1.100	0.065	0.020	0.035
74/11/03	09 40		0.910	0.800	0.075	0.015	0.090
74/12/07	14 10		0.910	0.700	0.015	0.005	0.030
75/01/04	10 50		0.830	0.600	0.025	0.005K	0.025
75/02/01	14 25		0.736	0.600	0.072	0.008	0.040
75/03/08	12 40		0.660	1.050	0.075	0.020	0.070
75/04/20	10 00		0.770	0.800	0.065	0.010	0.050
75/05/03	11 50		0.790	1.300	0.025	0.010	0.050K
75/05/21	16 10		0.790	1.200	0.075	0.015	0.160
75/06/10	16 00		0.770	0.950	0.095	0.015	0.080
75/06/25	09 00		0.790	0.800	0.020	0.010	0.080
75/07/12	10 40		0.620	0.900	0.090	0.010	0.060

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/01/27

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S FORK CHARITON RIVER
19117 7.5 CONFIDENCE
T/RATHBUN RESERVOIR
LGHT DTY RD BRDG 4 MI SSE OF BETHLEHAM
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/08/17	10 15		0.184	1.100	0.100	0.040	0.170
74/09/07	11 50		0.054	0.500	0.040	0.015	0.085
74/10/05	12 00		0.024	0.800	0.015	0.050	0.200
74/11/03	13 25		1.840	1.500	0.150	0.145	0.355
74/12/07	11 13		1.130	2.000	0.135	0.047	0.400
75/01/04	16 00		0.228	1.000	0.072	0.020	0.120
75/02/01	11 55		0.640	1.200	0.240	0.040	0.120
75/03/06	14 25		0.950	2.500	0.670	0.140	0.320
75/04/20	09 15		0.790	1.200	0.075	0.075	0.220
75/05/03	10 02		0.085	0.750	0.030	0.030	0.110
75/05/21	11 05		0.065	1.080	0.045	0.035	0.205
75/06/10	10 50		1.250	2.100	0.085	0.055	0.350
75/06/25	10 40		2.100	0.150	0.125	0.105	
75/07/12	20 10		0.005	0.950	0.070	0.030	0.120

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STORET RETRIEVAL DATE 76/01/27

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4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
74/08/17	10 50		2.520	3.200	0.850	0.640K	2.400
74/09/07	11 30		0.270	2.200	0.035	0.080	0.340
74/10/05	16 32		0.032	1.400	0.035	0.240	0.440
74/11/03	13 25		2.400	2.200	0.175	0.300	0.730
74/12/07	10 37		1.520	3.900	0.360	0.220	0.610
75/02/01	10 55		1.400	1.500	0.504	0.216	0.340
75/04/20	08 50		0.850	1.950	0.150	0.095	0.360
75/05/03	11 00		0.560	1.000	0.140	0.075	0.310
75/05/21	10 25		0.450	2.400	0.210	0.070	0.440
75/06/10	10 25		3.850	2.800	0.150	0.100	0.660
75/06/25	11 03		3.300	0.100	0.065	0.155	
75/07/12	19 20		0.780	1.650	0.030	0.070	0.300

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 76/01/27

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T/RATHBUN RESERVOIR
CHARITON RIVER
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4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
74/09/27	13 30		16.800	9.000	1.200	12.000	13.000	0.500	0.500
74/10/29	13 00		9.700	16.000	2.300	11.000	12.000	0.500	0.500
74/12/02	10 20		10.800	9.850	0.510	9.300	9.900	0.500	0.500
74/12/31	08 45		0.063	16.000	3.900	8.600	11.000	0.500	0.500
75/02/03	08 42		2.400	17.000	4.500	7.500	9.500	0.500	0.500
75/02/24	14 00		2.160	26.000	10.400	5.700	8.600	0.500	0.500
75/04/10	14 40		1.360	11.000	0.380		5.700	1.000	0.500
75/05/05	13 20		3.400	14.000	0.870	5.250	8.700	0.500	0.500
75/06/18	13 30		14.500	2.000	13.500	3.750	7.550	0.500	0.500
75/07/10	14 45		11.500	10.000	0.024	8.900	9.600	0.500	0.500
75/08/04	13 30		14.000	11.000	2.000	11.500	14.000	0.500	0.500
75/09/15	11 45		9.800	11.500	0.190	6.300	7.100	0.500	0.500
75/10/24	14 20		15.000	9.300	0.230	12.000	12.800	0.500	0.500